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Cargo Dwell Time in Durban

Lessons for Sub-Saharan African Ports

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Abstract

Based on quantitative and qualitative data, this paper attempts to identify the main reasons why cargo dwell time in Durban port has dramatically reduced in the past decade to a current average of 3–4 days. A major customs reform; changes in port storage tariffs coupled with strict enforcement; massive investments in infrastructure and equipment; and changing customer behavior through contractualization between the port operator and shipping lines or between customs, importers, and brokers have all played a major role. The main lesson for Sub-Saharan Africa that can be drawn from Durban is that cargo dwell time is mainly a function of the characteristics of the private sector, but it is the onus of public sector players, such as customs and the port authority, to put pressure on the private sector to make more efficient use of the port and reduce cargo dwell time.

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Cargo Dwell Time in Durban: Lessons for Sub-Saharan African Ports

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1. Introduction

There is increasing evidence that transport time decreases trade and increases logistics costs, notably because of increased inventories. Hummels (2001) demonstrated empirically that increased transport time dramatically reduces trade. That probably explains why the location of exporters is increasingly important and why Kwazulu-Natal, the province where Durban is located, contributes to 22% of South Africa's manufacturing gross domestic product with manufacturing activities principally located in the Greater Durban Metropolitan Area (Valodia, 2006 and Krugell et al. 2009). Among twelve major impediments, the automotive industry in South Africa listed reducing inventories as the most important objective (Barloworld 2010). Without reduced cargo dwell time and increasing dwell time predictability, the objective of reducing inventories is not likely to be met.

Ports and cargo dwell time in ports are critical. Arvis et al. 2010 demonstrates that for land transport to landlocked countries in Sub-Saharan Africa (SSA) over 50% of total transport time from port to hinterland cities is spent in ports.

South Africa has the largest number of intra-regional maritime connections with international carriers providing direct access to 29 other African countries (UNCTAD 2009). With the rise in maritime traffic volumes, at their peak, South African ports handled up to 185 million tonnes in 2008 before experiencing a slight drop in 2009/2010 because of the fallout from the global financial crisis. The demand at South African ports surpasses all countries in Eastern and Southern Africa (see Annex 1). With a network of eight ports, the country has a critical role to play in the international trade landscape for the region.

Widely acknowledged for relatively good performance compared to others in the region, South Africa and its network of ports is ranked 28th in the Logistics Performance Indicator (LPI) for 2010 followed by Senegal at 58th. The global trend of rising popularity of the container means African ports also experienced growth in the containerized cargo market. South Africa handled the highest container volumes reaching a peak of 3.9 million TEU's in 2008 with the Port of Durban[2] accounting for over 60%

[2] In South Africa, all ports, freight rail and pipeline infrastructure are owned by the Transnet Group (and all its subsidiaries). The South African government is the unique shareholder through the Department of Public Enterprise (DPE) which controls all parastatals. TNPA is the landlord port authority responsible for all the 8 national ports in the country providing port infrastructure and marine services as well as tariff setting and control of spatial allocation. Port operations are largely run by Transnet Port Terminals (TPT) with some small degree of private sector participation. The operations can be divided into 4 sectors namely bulk, break – bulk, automotive and

of the traffic. Table 1 below shows data for the period from 2005 - 2009 for container ports in the region, highlighting Durban's dominance in the container market.

Table 1: Port Container Traffic - Eastern and Southern Africa (000 TEU's)[3]

Port	2005	2006	2007	2008	2009
Durban	1 899.0	2 334.9	2 479.2	2 642.1	2 395.0
Cape Town	690.8	764.7	764.0	767.5	694.5
Mombasa	436.7	479.4	585.4	615.7	618.8
Port Elizabeth	369.7	497.2	422.8	423.8	441.4
Dar-es Salaam	258.4	272.7	334.0	373.5	473.7
Walvis Bay	71.4	83.2	144.9	170.5	Data
Maputo	54.0	62.5	80.3	92.2	107.0
East London	49.3	41.8	41.9	57.4	52.5

Sources: (TPT, MCLI, TNPA, OSC)

The critical location of Durban on the North South Freight Corridor, an important route for transit traffic bound for Zambia, Zimbabwe, Malawi and a connection going as far north as Dar es - Salaam, puts it on the spot light and its performance is extremely vital for countries along the corridor.

The Durban Container Terminal (DCT) has benefitted substantially from major infrastructure investments and it now comprises a new terminal known as Pier 1 and the old terminal known as Pier 2. With a capacity of 720,000 TEU's, Pier 1 has 3 berths with a 11,9m draft, 6 ship to shore gantries with 888 reefer points. The terminal operates RTG's. The larger old terminal, Pier 2 is currently designed for a capacity of 2,9 million TEU's and it boasts 6 berths over 14,000 ground slots with an average draft of 11,8m, 19 ship to shore gantries, 1117 reefer points. The terminal operates with straddle carriers'[4].

containers. The National Port Authority Act includes clauses to terminate the control of nationalized ports, but the implementation is still not on the political agenda and it also face resistance from Transnet management and the DPE.

[3] The port of Nqura has been excluded from the list as it mainly handles transshipments and started operations late 2009. Transhipments at the port make up approximately 60% of total traffic. In comparison with Durban, volumes at Nqura are significantly low.

[4] The port operates 24hrs a day 365 days a year. During day light the ships are restricted to 243.8m length with a maximum width of 35m and a draught of 11.9m or 12.2m according to tide and harbor master service. The largest ship calling the in 2009 had a 6.742 TEU carrying capacity which is relatively small by world standards but probably the largest to call at any African port. See Annex 3 for port and container terminal layout and Annex 4 for berth data.

Total TEU's handled across quay in 2010 for both piers was 2,5 million, still below the 2008 peak of 2,6 million.

Most of the containers going through Durban are destined for Johannesburg and transported by road while traffic volumes on rail have remained static over the years. A review study of the Durban Inland Intermodal Terminal and Logistics Hub conducted in 2008 reveals the turnaround time within the port area was too long and had major implications on efficiency thus dwell time (Arup, 2008).

Even though, from interviews, port performance usually emerges as the main culprit for long delays along transit corridors, disentangling port inefficiency is scarcely carried out, especially in Sub-Saharan Africa. However, in a country with relatively higher trade value, such as South Africa, this is of even more importance.

Therefore, this study seeks to identify what has been done at the Port of Durban in the last decade in Durban in the effort to reduce cargo dwell time within the last decade. It will also demonstrate the impact of reduced cargo dwell time on port operational capacity. This paper especially describes the of public sector actors, such as Customs, the port authority and the port operator.

The paper is based on interviews and data collected from a field visit to Durban carried out in January 2011. During the mission, extensive consultations with port stakeholders involving port authorities, shipping lines, freight forwarders, customs brokers and various cargo owners were undertaken. Data on dwell time was also obtained from a number of sources including Transnet Port Terminal (TPT) and the private sector port community[5].

The main lessons for Sub-Saharan Africa, which can be drawn from Durban port, are that cargo dwell time is mainly a function of the characteristics of the private sector, but the onus is on public sector players such as customs, the port authority, etc. to put pressure to change the behavior of the private sector port users to better comply and reduce cargo dwell time. In this regard, prohibitive charges for storage, coupled with strict enforcement, and the possibility to pre-clear with Customs with advantages attached to it and service level agreements binding both parties are critical tools for the reduction of cargo dwell time

The outline of the paper is as follows: section two presents descriptive data on cargo dwell time in Durban and compares it to several ports in Sub-Saharan Africa and decomposes the aggregate cargo dwell time figure. Section three presents the technical measures, such as cargo storage fees changes,

[5] Because of lack of detailed data and the limited share of transit traffic in the total traffic, the paper focuses on domestic cargo.

which have contributed to decreasing cargo dwell time as well as the role of public stakeholders, mainly Customs, the port authority and the port operator. Section four explains the justification of reducing cargo dwell time from an operational approach. Then, the main lessons for SSA ports are presented. In the sixth section two of the main remaining challenges to reduce cargo dwell time are discussed. The final section concludes and presents some factors, which could contribute to improve port competitiveness in general.

2. Cargo Dwell Time at the Port of Durban

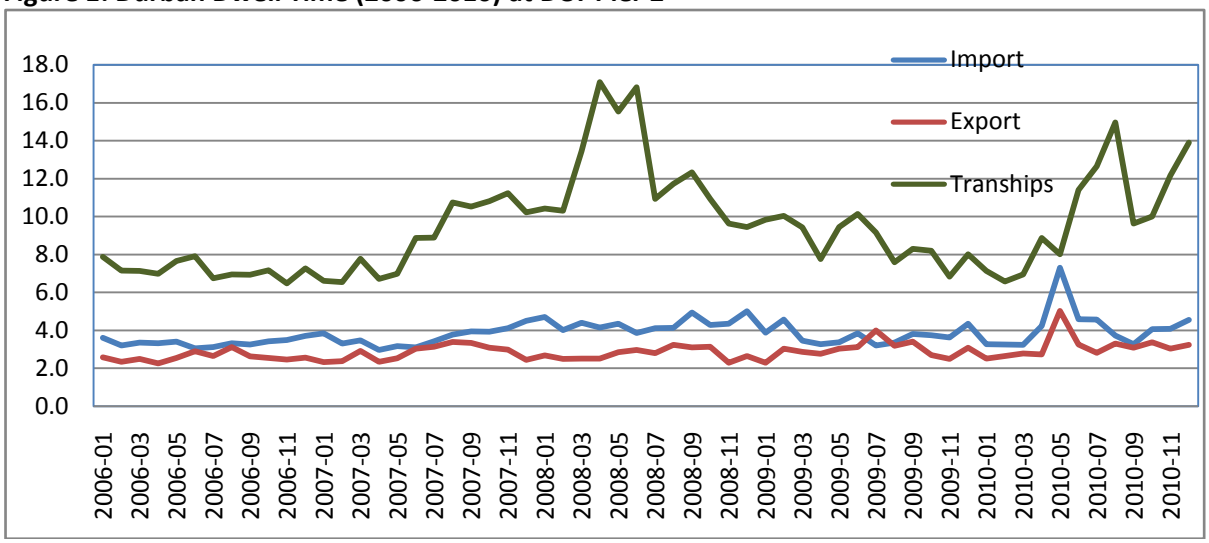
"Normal" cargo dwell time differs between ports and even more importantly between port users and stakeholders[6]. In the case of Durban, 28 days is the time limit for Customs to consider "abandoned cargo" and this then represents the end of "normal" cargo dwell time. Shippers, who represent the automotive industry, consider 3 days already as excessive dwell time. However, some small shippers would tend to consider "normal" cargo dwell time around 4-5 days.

In the absence of an irrefutable and uncontested benchmark of what is considered to be abnormal cargo dwell time, TNPA/TPT decided to target a dwell time of 3 days for the Port of Durban. In reality, it seems as if this target has been achieved. Data obtained for the Durban Container Terminal (DCT)/ Pier 2 (and confirmed by shippers and shipping lines), indicate a 3-4 days dwell time for that terminal since 2006.

The figure below shows that the average dwell time at the port is below 4 days for both imports and exports with a slight peak of 5 – 7 days around May 2010 which correlates with the 2010 Transnet labor strike period.

[6] See Refas and Cantens (2011) for a discussion on various definitions.

Figure 1: Durban Dwell Time (2006-2010) at DCT Pier 2



Source: Transnet Port Terminal

Dwell time for transshipments is around 5 to 10 days with a few irregular peaks at around the 15 days mark, notably between July and September[7]. This is also related to the fact that "free time"[8] for transshipment is set at 7 days (with low charges below 15 days)[9].

It should be noted that cargo is generally moved from the terminal to bonded warehouses before the expiry of the free storage period of 3 days offered by TPT. Therefore, the information provided does not capture all dwell time figures for the port. Additional data were also collected from those involved in cargo handling for the period from January to December 2010. The data are based on accounting information from arrival at port to the time cargo is passed on to the owner. The data shows that on average most cargo is held for less than 4 days (referred to as overstays).

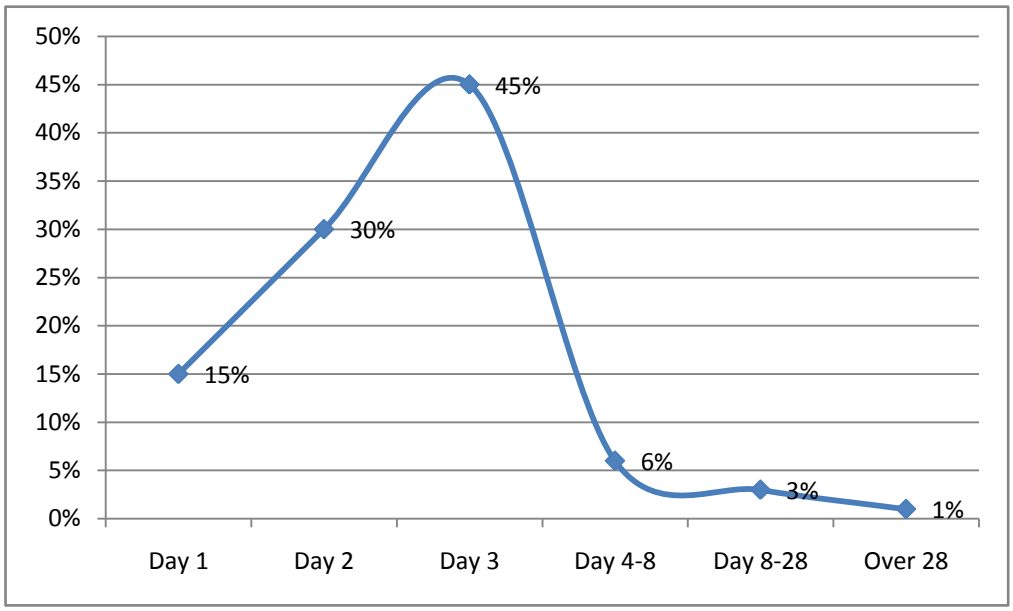
According to the main shipping lines/warehouse owners, less than 10% of containers go beyond the 3 day period and less than 1% go beyond 28 days. Based on these multiple interviews, it was possible to reconstruct dwell time frequency (see Figure 2).

[7] Transshipments account for approximately 20% of total cargo.

[8] Free time is defined as the time from when the vessel completes discharge and the container is stored in the port area until collection for a specified period without incurring any port storage charges. For import containers this is set at 3 days and 7 days for transshipments.

[9] Figure 1 suggests that dwell time for exports and imports is rather similar and could tend to demonstrate that the lower limit is rather close.

Figure 2: Durban Cargo Dwell Time Frequency



Source: Interviews with TPT and with major shipping lines and warehouses operators.

Therefore, Durban appears to be a good benchmark for Southern Africa, but even more importantly, for SSA ports. Durban is, indeed, by far the port where cargo dwell time is the lowest in Southern Africa and SSA in general (see Table 2 which presents data collected for the Africa Infrastructure Country Diagnostic (AICD) for Southern Africa and Table 3 for selected ports in SSA).

Table 2: Dwell time in Southern Africa

	Cape Town	Durban	East London	Port Elizabeth	Walvis Bay	Luanda	Beira	Maputo
	South Africa				Namibia	Angola	Mozambique	
Container dwell time—average (days)	6	4	7	6	8	12	20	22

Source: Africa Infrastructure Country Diagnostic, 2009

Table 3: Dwell time in Sub-Saharan Africa

Durban	Douala	Lome	Tema	Mombasa	Dar-es-Salaam	**Average (Durban excluded)**
South Africa	Cameroon	Togo	Ghana	Kenya	Tanzania	
4	19	18	20	9	19	**17**

Source: Refas et al (2011) for Douala, surveys for the other ports.

When cargo dwell time is broken down between operational, transactional and discretionary storage[10], it appears that Durban favorably compares with Mombasa and even more so with Dar-es-Salaam[11]. The most significant difference concerns clearance procedures, where up to 6 days can be gained, as well as for discretionary storage. The last factor seems to play a major role and is therefore discussed in detail below.

[10] Operational dwell time is mainly the time to unload vessels and store in yards. It mainly depends on the efficiency of the port and the availability of equipment combined with the level of occupancy of the storage facilities. Transactional dwell time mainly concerns the transaction time between the importers/port services and customs. Discretionary storage is the residual after having taken into account operational and transactional dwell times.

[11] In an ideal situation, the minimum time for the transactions is 1 day for clearing the cargo depending on whether a physical inspection is required. Another 1-2 days for the transfer from the vessel to the yard and a similar amount for the transfer from the container yard to the ODCY. Finally it would require half a day/ a day to pay the port and shipping fees and exit the port, which means that mean dwell time can not really go, on average, below 3 days.

Table 4: Comparative Breakdown of Cargo Dwell time Between Durban, Mombasa and Dar-es-Salaam

Port Activities	Durban		Mombasa		Dar-es-Salaam	
	In days	Ratio days/ benchmark	In days	Ratio days/ benchmark	In days	Ratio days/ benchmark
1. Time to unload vessel and store containers in yard (days)	1	1	3	**3**	3	**3**
2. Complete clearance procedures incl. physical inspection (days)	1	0.5	3	**1.5**	6	**3**
3. Additional/discretionary storage	1	1	1	**1**	7	**7**
4. Arrange land transport and complete exit procedures (days)	1	1	2	**2**	3	**3**
Total average dwell time (days)	4		9		19[12]	

3. How Can Low Cargo Dwell Time Be Explained?

In the late 1990s, the port of Durban was notorious for its inefficiency and high levels of congestion. It was characterized by long berthing delays for container vessels, long train turnaround times in the port and long queues for road trucks and this resulted in dwell times of around 6 – 7 days. In 1998, shipping lines lost their patience and introduced a vessel delay surcharge. This was a waking call for TPT and TNPA. A committee was created involving the port stakeholders with a defined strategy and several measures, which seem to have had the most important impacts, were introduced. These were seen as drastic changes (and enforcements) namely that of port tariffs as well as Customs modernization.

[12] Figures reduced in 2010 due to traffic decrease, which made possible decrease of time for steps 1, 3 and 4. Moreover, storage and ODCY storage capacity increased, which has also contributed to reduce congestion and possibly dwell time (even though dwell time of cargo is usually complex to obtain and sometimes unreliable).

A Change in Storage Pricing of the Port Operator

TPT explained that to achieve their target of 3 days dwell time, one of the more practical and simple measures employed was to enforce terms and conditions related to storage of cargo at ports, which states that within 72 hours of the discharge of each container from the vessel the Customer or the Container Operator shall provide the Terminal Operator with delivery instructions in respect of all containers discharged. All containers remaining after the expiration of the 72 hr period shall incur storage charges as shown in table 5 below[13]. Charges for Durban are almost six times as high as other ports in the country.

Table 5: Storage Fees for Import Containers

No of Days	Tariff per Container Type (USD estimate)	
	6m/20'	12m/40'[14]
Day 1 - 3	Free Storage Days[15]	
Day 4	90	181
Day 5	237	475
Day 6	477	954
Day 7	716	1,432
Day 8	956	1,911
Day 9	1,195	2,389
Day 10	1,435	2,867

Source: Transnet

Uncleared cargo or cargo detained by customs for inspection is moved to licensed container depots either by the carrier or the terminal operator. The licensed depots generally provide a cheaper storage option compared to the terminal charges. It is estimated that about 90% of cargo can and is generally cleared within 3 days and only less than 10% of cargo is moved to bonded warehouses where the average stay is estimated at around 7 – 8 days with less than 1% of these ending up as long stay or abandoned cargo (i.e. 28 days or more) which then goes to a state auction. Free storage for

[13] It is worth noting that the free time period in most SSA countries is much higher: 11 days in Douala, Cameroon or even more in West Africa.

[14] Forty-feet equivalent Unit

[15] The first 3.25 days (78 hours) are free, the free period is applied from 00h01 on the day the vessel completes discharge until the container leaves the gate or is loaded for rail or until the 78 hr period is reached.

transshipments is 7 days, which probably explains the higher dwell time. However the proportion of transshipments at Durban Port is small.

While the 3 day storage policy released much needed capacity inside the terminal, to address congestion around the port area, TPT identified peak periods for collections at 8am – 11am and 2pm – 4pm which also happen to coincide with the general Durban city commuter traffic peak with a resultant conflict between the two creating massive congestion in the city and constraining port access. Cargo handling companies and large consignees such as Toyota were targeted and encouraged to collect goods at night or during off peak periods.

Despite all these efforts, it is reported that almost 50% of customers still collect their cargo on the last day of free storage.

Therefore, major stakeholders acknowledge that the introduction of the "punitive storage charge" after day three is probably the most important single event impacting on dwell time at Durban port. Even though it took some months for the impact to materialize, DCT saw a continuous drop in dwell time and a reduction in the number of import boxes in yard at any given time.

It is worth noting that this was possible since systems to allow for prompt clearance and release were in place. Even though pre arrival clearance has always been possible, it is noted that the length of dwell time before the increase in port tariffs was certainly due to the low storage rate, which was at that time approximately 10 USD per TEU per day, often cheaper than taking delivery if there was going to be commercial storage required. For the storage policy to be effective, it does require the terminal to perceive itself as part of a logistical chain and not as a storage facility. Once it has that mindset then dwell times will fall assuming there are systems in place to allow for prompt clearance.

The Role of Public Sector in Improving Efficiency

Customs

It would obviously be unacceptable for TPT to impose such a charge to cargo owners when it is not possible to clear cargo from customs. Therefore the importance of customs performance in the issue of dwell time cannot be over emphasized.

Studies show that some of the major delays at ports and border crossings are because of inefficiencies by the customs agencies. As pointed out by Raven, efficiency of ports or even the timing of many of its activities is strongly influenced, if not dictated, by customs (Raven, 2000). The target for South Africa's Revenue Services (SARS) Customs, is to clear within 3 hours for declarations processed through Electronic Data Interchange (EDI). According to SARS, during the first quarter of 2011, the

average time to release goods was 3 hours when processed through EDI and 10 hours when not processed through EDI (with 75% of declarations processed through EDI).

With customs clearing cargo in less than 1 day and TPT efficiently moving cargo from the terminal area, it is probably safe to assume that there is "no transactional dwell time" at the Port of Durban as expressed by one stakeholder (or at least it is rather limited for a Southern or SSA standard).

Various research notes that customs service, rapidity of processing, simplicity of documentation influences port competitiveness. The Customs modernization project made a significant contribution to improving the competitiveness of the Port of Durban.

The project delivery strategy of enhanced compliance recognized three key elements influencing customs operations, namely; (i) some taxpayers/traders will always try to comply whether effective enforcement exists or not: (ii) the goal is to influence the undecided majority who will choose one way or the other based upon how well the strategy is implemented and (iii) some taxpayers/traders will not comply whether effective enforcement exists or not – the criminals.[16]

Within that context, the strategy was based on the fundamental principles of making it easy for those trying to comply by improving services and making it hard for those who do not want to comply by improving enforcement. Therefore, measures aimed at increasing treatment differentiation and compliances were initiated. In this regard, contractualization between customs brokers and customs was developed. For instance, for companies wishing to get an authorized economic operator status, needed to go through detailed interviews and be transparent regarding their economic activities and supply operations and are, from time to time, controlled randomly. However, these companies [17]benefit from a green channel, which means that as soon as the cargo is handled at the port, it can be removed. Contrary to most countries in SSA, pre-clearance is then the rule and this explains why the target for customs clearance time is in hours and not in days like in other countries.

Transnet Role and Infrastructure Investments

From an infrastructure perspective, South Africa was ill-prepared for the increased trade at the time of adopting its port liberalization policy. The trade infrastructure was ageing and had been neglected for many years; naturally most of the South African ports were under performing. As the size of the container vessels calling at South African ports continued to increase, port or terminal congestion

[16] Presentation by the Commissioner of SARS, SARS Custom Modernisation: The Modernisation journey; available on www.sars.gov.za.

[17] SARS identified its top 20 clients to get accreditation with benefits such as green line, fewer inspections, post clearance audit etc. These companies account for approximately 70 – 80 % of total cargo.

became a critical issue thus increasing the risk of delays. With Durban housing the largest container terminal, it was in the spotlight, it quickly gained a reputation of inefficiency and the words congestion and delays were synonymous with the port itself. When the Minister of the Department of Public Enterprise finally made an announcement about the infrastructure development cash injection into the ports in 2001[18], the shipping lines were encouraged and in no time, the surcharge was dropped. From 2002, Transnet invested more than 700 million USD over a five year period focusing on creating capacity and equipment. But, this was only the beginning of a long and hard but determined transformation process by Transnet.

To date, the Port of Durban has seen the capacity of its container terminal increase to approximately 3.6 million TEUs per annum with DCT standing at 2.9 million TEUs and the transformation of Pier 1 into a high tech facility of 720,000 TEU's per annum. The investments in the container terminal also included 6 cranes in Pier 1 and 19 cranes with twin lifting capability in Pier 2. Further infrastructure improvements included widening of the harbor channel entrance to 225 m and a deepening to 19 m at the approach. The berthing draft is still below 12 m however it is intended to be deepened to 16.5 m.

As with most Transnet infrastructure, information and communications technology (ICT) was also a neglected area and ICT transformation was one of the main elements of the Transnet reengineering strategy. One of the key developments in ICT was the introduction of automated systems using RFID tagging, high definition cameras, optical character recognition of license plates and information exchange with SARS to replace truck drivers and vehicle checks aimed at reducing the length of queues[19]. This also includes the move from Cosmos[20] to NAVIS[21] terminal operating system, first piloted in Pier 1 at its opening and has been introduced in all ports except Pier 2 over the last year.

[18] For a five year period up to 2009, Transnet had made capital investment of up to UD$11.5 billion with 59% spent in infrastructure related projects; 32% on rolling stock; 9% on machinery, equipment and a floating aircraft. In 2009 alone, 43% was spent at Durban.

[19] Changing the way Transnet works, Internal Newsletter, 2010 available from the Transnet website, www.transnet.co.za.

[20] Cosmos offers terminal operators, stevedores, shipping lines and port authorities advanced ICT solutions that streamline the logistics of container terminal operations. The applications in the Cosmos suite helps plan, track and monitor all container movements in the terminal, from arrival until departure, including booking, document handling and invoicing (http://www.cosmos.be/container_terminal_systems.aspx)

[21] Navis is the technology for managing the movement of cargo through terminals. It provides cargo tracking through the port, automated equipment operations, management of multiple terminals through an integrated, centralized solution. It integrates the industry's leading terminal operating system with select, 3rd party technologies, to offer complete, pre-integrated solutions that are deployed quickly and easy to maintain (http://www.navis.com/about_us/index.jsp)

Pier 2 is currently crossing over from COSMOS to NAVIS. As expected, teething problems are prevalent at the port of Durban as a result of the move.

While there are questions about the return on infrastructure investment, there is general acknowledgement of the challenges brought about by the new infrastructure regarding human resource. A study on the competitiveness of ports in Korea and China identified the role of professionals and skilled labor force in port operations, the sophistication level of port information and the scope of its applications, as some of the key elements for competitiveness (Gi Tae-Ye et al, 2008).

With new equipment on board, there was an urgent need to train operators in the use of the new equipment. TNPA has committed to enhancing human capital in line with the Transnet group's growth strategy. Training opportunities focusing on marine operations, port engineering and leadership development programs are available. In the case of Durban, TPT trained operators to work on the new equipment with speed but in a safe way. A training service provider from Singapore was recruited to assist in this regard. Some of the techniques they learned include hoisting a container by the crane adopting a parabolic profile, which reduces the hoist cycle time by more than 45% thereby boosting container handling frequency. TPT's performance highlight for 2009/2010 includes improved productivity at DCT and Pier 1 with increase of 4.6% and 26.3% moves per Gross Crane Hour (GCH) respectively. DCT currently operates at a productivity of 28 moves per GCH, a major improvement from the 19 moves per GCH a few years ago (Transnet, 2009).

Although Transnet had embarked on numerous initiatives to improve performance through investment in infrastructure and its human capital, the behavior of third parties remained a challenge. It is reported that in 2001, information provided by shipping lines had an accuracy of 43%, making operational planning a headache. A strategy to alter behavior patterns of the private sector was developed.

One of the key initiatives to achieving this was the introduction of the Container Terminal Operation Contract (CTOC) with key customers, mainly shipping lines. CTOC entails establishment of service level agreements between TPT and its customers regarding expected performance levels. These bind the parties through contract to deliver specified targets such as level of service based on agreed performance indicators (i.e. dedicated berthing window, guarantee 28 moves per GCH etc) on the part of the terminal operator and observing specific regulations on the part of private port users (i.e. compliance with specific requirements such as providing accurate information etc). Commercial

agreements with shipping lines now stipulate a 96% accuracy of information provided[22]. Failure to do so attracts sanctions. Enforcement of CTOC agreements has been critical for success.

The interesting thing about the CTOC is that staff can commit to these targets as well and at the moment about 5% of TPT staff have committed to a service level performance of 28 moves per hour. Further incentives include a commitment to specific customers to be afforded an agreed level of service, be it reduced, during periods of disruption such as labor strikes, etc. while the customer commits to clearing cargo from the port within agreed times. With the bigger customers agreements may even involve doing bulk runs at night.

In an environment where inefficiencies prevail, the private sector feeds from the public sector's inefficiency, therefore creating a virtuous cycle of inefficiency and corruption on both sides. The basic issue here is really a need to establish rules of engagement and enforcement on both sides but the onus is on Transnet to enforce the rules while fulfilling its mandate of providing an efficient service to its customers. And so far, this arrangement seems to be working well.

TNPA also established port user forums for some of the key stakeholders, coordinated and chaired by TNPA itself. These have been divided into six clusters as follows: Automotive, Coal, Containers, Iron Ore, Liquid Bulk and Manganese. In the case of the DCT and Pier 1 there is a container terminal advisory board which meets on a monthly basis. These meetings provide TNPA and its customers an opportunity to discuss issues and try to find solutions together. While the process started off with both parties playing blame games, the partnership between TNPA and its customers appears to be working well as reflected by the recent Barloworld survey of 2010. At least, more than half of those in the automotive industry proclaim that logistics capacity of SA's ports has improved in the last two years and they also think that the loading and docking capacity is now competitive and comparable to international practice. The Industry also gave customs a vote of confidence by confirming that compliance processes are being dealt with more efficiently than in the past and that corruption has decreased, and physical security of goods in the port has improved (Barloworld Logistics, 2010).

4. Why Was It So Important to Reduce Cargo Dwell Time?

Aggressive policies against long dwell times are often pointed at by shippers as unfair and disproportionate. The complexity is to set tariffs and measures that are, on the one hand, strict enough

[22] Some of the items stipulated in the agreements include Estimated Time of Arrival (ETA), Container lists or EDI capability.

to discourage shippers from using the port as a warehouse, and on the other hand, realistic given the time necessary to perform clearance formalities and operations.

In the case of Durban, a target of 3 days has been considered both realistic and necessary to achieve acceptable operational performance and it has been achieved through a set of direct and indirect measures. If one were to evaluate the impact of such dwell time reduction on terminal handling capacity and productivity, several factors need to be taken into account:

- the physical capacity of the port; and
- the usage patterns (dwell time distribution, traffic distribution, etc.)

Physical capacity is indeed a critical factor in port planning that is directly affected by long dwell time patterns (the higher the dwell time the higher the occupancy of the yard). When facing capacity shortage issues port planners have however a tendency to immediately consider capacity extension projects without envisaging a more optimal use of the existing capacity.

We argue that dwell time reduction is often a more efficient way to release additional capacity in a container terminal at limited cost. But this depends also on usage patterns and more specifically on dwell time distribution and occupancy ratios[23]. For example we have developed a simple model to estimate the impact of dwell time reduction in Durban container terminal given the current usage patterns and port capacity.

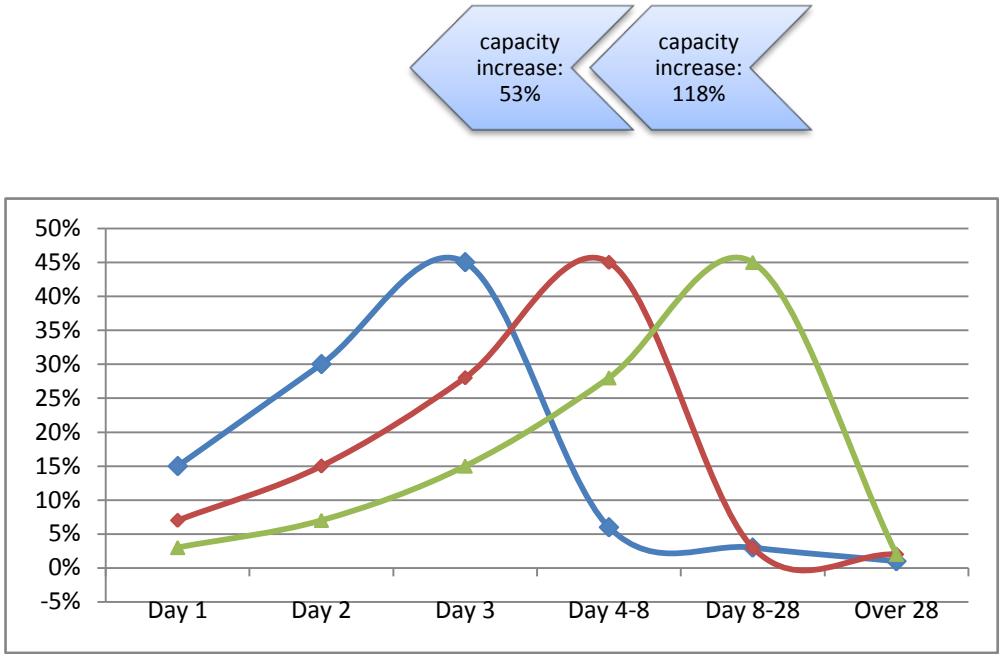
Figure 3 shows the dwell time distributions in three scenarios:

- short dwell time with an average of 3.3 days (blue curve, actual situation);
- medium dwell time with an average of 5 days (red curve); and
- long dwell time with an average of 11 days (green curve).

The impact of dwell time reduction between scenario 3 (green curve) and scenario 2 (red curve) is very significant: an estimated 118% additional capacity is released in the container terminal. The later reductions between scenario 2 (red curve) and the current situation (blue curve) is also important: 53% additional capacity is released. In total, reducing dwell time from scenario 3 to scenario 1 more than doubles the practical capacity of the container terminal without any investment in physical extensions.

[23] Dwell time reduction will have for example a much more sensible impact on a congested terminal for example than in a container terminal with spare capacity.

Figure 3 - Estimated dwell time distributions in the port of Durban and impact of dwell time reduction



Source: Local interviews (TPT, MSC and Maersk) and own estimates.

By using a simulation model of operational movements in container yards we show in addition that using information about dwell time for the optimal allocation of containers in the container yard would lead to additional capacity release of up to 40% in a congested container yard. Containers that are expected to be released quickly are indeed best positioned on the top of container piles to avoid double-handling. On the contrary the long stay containers should be stored in the lower levels of the piles or separately to avoid multiple repositioning before clearance.

5. Lessons for Ports in SSA

As articulated in the State of Logistics (SoL) surveys conducted annually by CSIR and others, "the performance of the supply chain depends on the quality of the service provided by the private sector, in collaboration with the proficiency and diligence of public agencies"(CSIR, 2006).

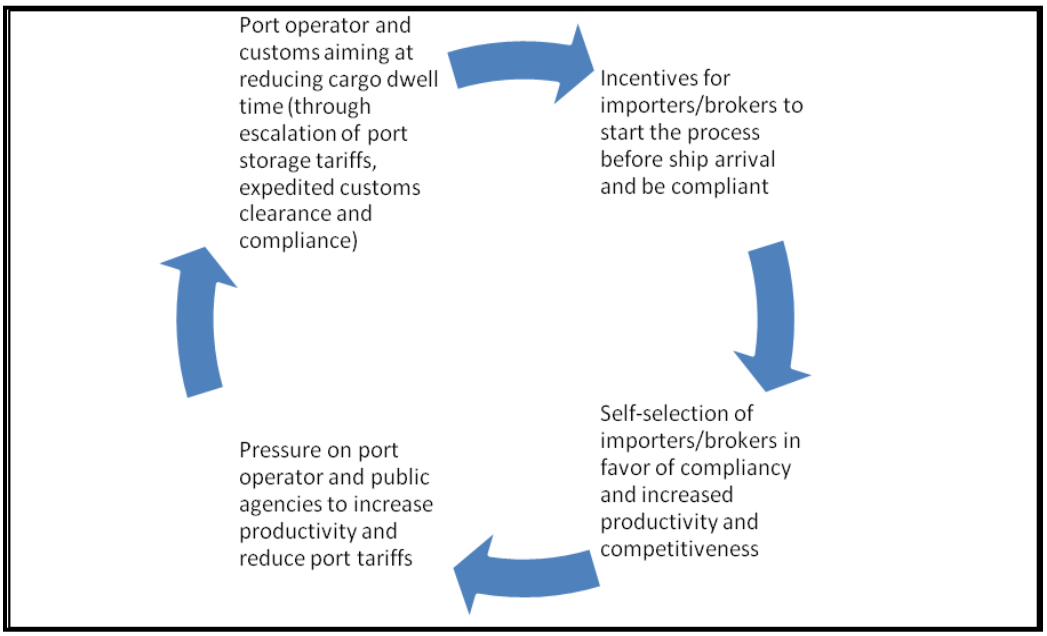
TPT's approach, in managing lower levels of occupancy, involves freeing up space and improving distribution in the terminal concentrating mainly on the enforcement of the 3 days free storage policy and encouraging cargo operators to remove their goods from the terminal as soon as possible but within the free storage period. Measures applied include publishing information related to arrival times of cargo expiry times for free storage period and sending regular reminders via sms to encourage early collection of cargo. TPT also sought close cooperation with its customers targeting the large operators, including shipping lines, and transporters, and offering incentives for clearing cargo early by allocating preferential slots and stacking containers in a batch to facilitate the collection process.

With most customers able to complete customs clearance procedures within 3 days, the majority of port users do comply with the 72 hour policy, otherwise the implications for failure to comply are later reflected in the cash books[24], a key issue for the logistics industry regardless of size but even more so for the South African industry struggling to recover from the global financial fallout.

Within this context, the main lesson for the rest of SSA is that: cargo dwell time is a function of the characteristics of the private sector BUT the onus is on the public sector (customs, port authority) to put pressure on private sector port users to make them more efficient (gradually). In South Africa, due to the increasing importance of manufacturing/assembling industry, which competes worldwide, Transnet is under severe pressure to perform and improve, not only from the private sector but also from a government anxious to meet trade policy objectives. Therefore, a virtuous circle is in place as demonstrated in Figure 4.

[24] This does not necessarily mean that prohibitive tariffs has to be replicated in all ports in SSA since if not implemented, it would only lead to increased corruption and would then undermine the current situation.

Figure 4: The Virtuous Circle of Cargo Dwell Time



To get a sense of this point, it is important to understand the nature and characteristics of South Africa's private sector as it appears to be the main divergence from most countries in Sub-Saharan Africa. A good place to start is by noting the trading policy of the country which moved from an import substitution economy to value added manufacturing export in the late 1990s. This change integrated the countries trade into the global market and more than any other country in Sub-Sahara Africa, South Africa has strongly diversified export characteristics with a significantly advanced manufacturing industry making it the most competitive regionally. South Africa's manufactured export goods serve the region but largely concentrate on Europe and America. However, from an international trading point of view, its geographic remoteness from its key markets places a significant amount of pressure on its global competitiveness.

According to the South African government, the country's automotive industry is a global, turbo-charged engine for the manufacture and export of vehicles and components. The sector accounts for about 10% of South Africa's manufacturing exports and contributes about 7.5% of the country's GDP[25]. Manufacturing in the country is concentrated in the provinces of Gauteng and Kwazulu Natal (KZN). In KZN alone, 80% of manufacturers export to Europe with most firms involved in both import and export

[25] Source: South Africa info, a website developed by the department of trade to provide basic information about the country and a promotion tool for the South African marketing council.

(Valodia, 2006). For example most of the auto manufacturers import parts that are used to assemble vehicles and the finished product is exported back to the key market, in most cases, Europe.

South Africa is also the largest food exporter in Africa and in 2007 the export value of its goods was $ 4.2 billion (UNCTAD 2009) approximately 2% of GDP. Given its disadvantaged location and a few other inefficiencies in the manufacturing system, logistics is one of the few key areas were the country developed as one of the best in the world[26] therefore improving the country's competitiveness.

Another major observation at the Durban Port is that most of the cargo going through the port is for the domestic market dominated by large companies as cargo owners but also cargo operators. Transit or over border cargo as they call it, account for a very small share of the total cargo traffic. In most coastal countries in Africa, these account for a larger proportion of import cargo and most of these countries a significant proportion of the transiting goods experience problems relating to documentation and abandoning of the cargo. Most of the big operators in South Africa also have service level agreements with TPT and they prequalify their clients to ensure legitimacy and to avoid taking clients with a low or non compliance record.

In the case of South Africa, any form of delay at the port is a major irritation for the manufacturing industry but even more importantly as expressed by someone in the automotive industry, they also have huge financial implications for those operating in a competitive environment as their businesses have to absorb any cost inefficiencies wherever they occur.

For most shippers, hours count. The Citrus Growers' Association in South Africa estimates that delays at the Port of Durban cost its growers US$10.5 million per season (on approximately US$400 million of exports), based on an average delay per load of 12 hours for each of the 20,000 citrus laden trucks that enter the port during peak season (World Bank, 2011).

It is no surprise that import and export traders have very little tolerance for poor performance by a state run freight company, neither does the Department of Trade and Industry which has the responsibility of attracting investments into the country.

In what looks like the key dynamic of the private sector in SA, a Barloworld survey of businesses involved in manufacturing and logistics, the industry expresses a sense of ownership to the logistics process. While recognizing that public sector is key to this, they feel that the onus is on them to agitate and drive the process to see transformation at Transnet (Barloworld Logistics, 2010). The strategy seems to have contributed to reducing delays at some of the ports in South Africa. Facing internal pressure

[26] Logistics Performance Index, 2010.

from the trade industry and a Trade Ministry eager to establish the country on the world stage, those responsible for facilitating trade (Transnet and SARS) had no choice but to transform.

This presents a marked difference between the private sector in South Africa and that of other African countries studied. With the exception of Kenya, most countries in Sub-Saharan Africa are characterized by trade dominated by a handful of commodity exports or non time sensitive agricultural products and very little value-added production, not even for the domestic market. Therefore, most are largely dependent on imports of goods from China and India. Even then, the markets are generally small with very little space for more than one large firm as a result, most firms operate monopolies without any competition and under an extremely weak regulatory environment. For most, as we found in Cameroon, inefficiencies in the supply chain can be easily passed on to a captive consumer market while profits remain high. However, at the time when trade diversification has become a motto; without a more advanced and less rent-seeking private sector, it will be extremely difficult to increase value-added and then achieve diversification.

6. What Remains to Be Done to Reduce Cargo Dwell Time?

Judging from the reported container dwell time performance, Durban may have successfully managed to shed its reputation as a congested and inefficient port. Over the last few years, there has been significant progress in improving the efficiency of DCT but challenges remain, particularly with regards to labor productivity and port access, all of which have an impact on cargo dwell time.

Increase Labor Productivity

Using the number of cranes moves per hour as an indicator, productivity levels at DCT have been gradually improving over the years increasing from 17 moves per hour to the current 28. However, a recent study commissioned by the Port Regulator suggests that the current levels are not sufficient to bring Durban to the performance standards of the world's best ports. The report shows a comparison of Durban with five[27] other ports in different parts of the world and finds that the port falls short in the area of productivity, operating at a rate of 23 moves per hour in 2007 while the best port was operating at a level of 94 moves per hour (Ports Regulator of South Africa, 2010). But it may well be because some of these ports use much more advanced equipment.

[27] Antwerp, Belgium; Klang, Malaysia; Laem Chabang, Thailand; Rotterdam, Netherlands and Santos, Brazil.

Given that the port achieves its target of 28 moves per hour, the main issue emerging from the interviews is the lack of consistency across shifts. It was reported that some shifts perform better than others, meeting the agreed target of 28 moves per hour while others don't. Possible reasons for this inconsistency could be poor supervision or lack of staff motivation. The introduction of performance contracts tied to an incentive scheme was introduced with the aim of encouraging staff to meet specified targets daily in order to improve the improve the movements of cargo and to keep terminal occupancy levels below the specified threshold of 70%. It should also be noted that only 5% of TPT staff have committed to that level of performance. It is possible that the performance contracts are not yielding the expected results and in that regard there may be a need to review their design and improve if necessary.

Stability of port labor was also mentioned as a key concern for stakeholders as it is perceived to have an impact on operations. The high turnover of management staff is listed ias a major cause of instability and a desire for this to be reduced was expressed.

However, the greatest irritation seems to stem from the fact that strikes are widespread in South Africa. In 2010, there was a protracted strike over pay and conditions lasting for almost 3 weeks starting from 10th to 28th May. The strike effectively closed all port operations and the recovery took months also evident in the dwell time data presented earlier.

Improve Port Access

South Africa's infrastructure quality is good compared to other SADC countries, and current investment in infrastructure will ensure that this position is maintained in future. However, one major inadequacy is the lack of intermodal facilities and integration between transport modes, which needs to be addressed before South Africa can be seen as a true regional logistics hub (CSIR, 2007).

The port of Durban has good road connections to the extensive national trunk road network but the access roads in its vicinity suffer from congestion. Mainly due to its location inside the Central Business District, port traffic is sometimes in conflict with general traffic particularly during commuter traffic peak hours therefore constraining port access and general movement of traffic.

While road still dominates, rail transport plays a major role in transporting a large bulk of commodities, with some dedicated services. However turnaround times are still very high. With regards to access, DCT is linked to 4 rail tracks with rail mounted gantries for loading and unloading. In 2008, Transnet reported that it handles up to 16 trains per day in and out of the terminal area and this have increased to 22 over the last few years (Arup (EThekwini Municipality report), 2008).

As previously mentioned, most of the cargo at the port of Durban is either destined for or originates from the main economic areas in Gauteng. With the exception of commodities, a lot of stuffing and destuffing of containers seems to take place in the Bayhead area[28]. Bayhead is served by two rail tracks and road access is through Bayhead Road and South Coast Road. Bayhead Road currently suffers from congestion mainly from operations located along that road and other city related traffic.

In addition, there are significant space constraints in the Bayhead area and the current operation is inefficient and exacerbates the conflict between port and other city economic activities. As mentioned earlier, the result of this conflict is restricted access to the port and increased turnaround times.

To alleviate the situation, the Ethekwini report recommended the development of an inland logistical hub, increasing capacity and improving rail turnaround times within the port area. If implemented, these improvements will improve port access issues resulting from congestion around the port area.

7. Conclusions and How to Improve Port Competitiveness

Durban enjoys unparalleled dominance in Sub-Saharan Africa from a size and performance perspective, but TNPA's aspiration to make Durban globally competitive means the port has to meet the standards of other international ports such as the ports of Singapore, Rotterdam and others.

The main lessons for Sub-Saharan Africa that can be drawn from the Durban port are that cargo dwell time is mainly a function of the characteristics of the private sector, but the onus is on public sector players such as customs and the port authority to put pressure on private sector port users to better comply and reduce cargo dwell time. Further cargo dwell time reduction is still possible; however, it will be more difficult than what was the case in the early 2000s.

The level of service has significantly improved in the last decade. However, in order for Durban to become a worldwide major port, TNPA still has to overcome a few challenges which are crucial for port competitiveness from a cost perspective i.e. high port costs labor productivity and relatively inefficient inland transport networks. Some of the issues of concern are already highlighted by the

[28] Private sector companies involved in stuffing and destuffing of containers are located in a small area in Bayhead, Shipping and logistics companies and storage areas are located in and around the port area in a haphazard fashion, contributing to road congestion, conflicting with other economic activities.

Regulator's report on the economic review of South African ports[29]. These issues are not just important for dwell time. While the port of Durban has seen meaningful improvements over the last few years, the challenge to address the above mentioned issues still remains.

The South African logistical capacity is as good as any developed country in the world; however, logistical costs remain high. Cargo dues (berth costs, wharf age) and terminal handling charge, account for more than 50% of total port costs in South Africa, a proportion far greater than at any other port in the list (see Annex 5).

The issue of port dues is a major concern in the country, an aspect that is also raised in the regulator's report. According to TNPA, *Cargo dues on all commodities, articles, things or containers (full or empty) are levied at all ports belonging to or controlled and managed by Transnet. Cargo dues are charged to recover the cargo contribution towards port infrastructure* (TNPA, 2007).

It is noted that 70% of the port authorities' income is derived from port charges and NEDLAC's view is that Transnet's port charges are strategic and have characteristics of non-port financial objectives. With the LPI showing that more than 50% of SA port users perceive charges to be high/very high, clearly Transnet needs to pay attention to the issue in order to attract customers.

Among other things, the issue of transparency of port charges[30] is an important factor to port users (NEDLAC, 2007). Historically, Transnet has been perceived to be lacking in transparency and this creates unnecessary suspicion from its customers and the public in general. Given the existing concerns about cargo dues, improving transparency will by no means improve efficiency but it will change the existing perception of foul play and therefore increase stakeholder confidence but also help in attracting investors.

In summary, cargo dwell time is relatively close to international standards in Durban but certain issues remain to make Durban fully competitive worldwide, such as reduced cargo dues (in order to avoid excessive investments in infrastructure and equipment).

[29] In Annex 5, a diagram shows a list of some of the most important factors for port competitiveness.

[30] The NEDLAC report sought to examine administered prices in port services and port operations and it states that limited access to information was a major problem for that particular study noting concluding that there is low trust and frustration between the players in the port system. It therefore recommends that price and performance indicators be collected and made public by the Department of Transport for the purposes of establishing an information basis for monitoring the South African waterfront. This is particularly problematic as there is a general sense that Transnet cargo dues are set to target revenues for the holding company.

However, labor, energy, tax regulations, etc. may be of even more importance for a firm to be competitive worldwide, and Durban port should not be blamed for the lack of competitiveness of South African firms.

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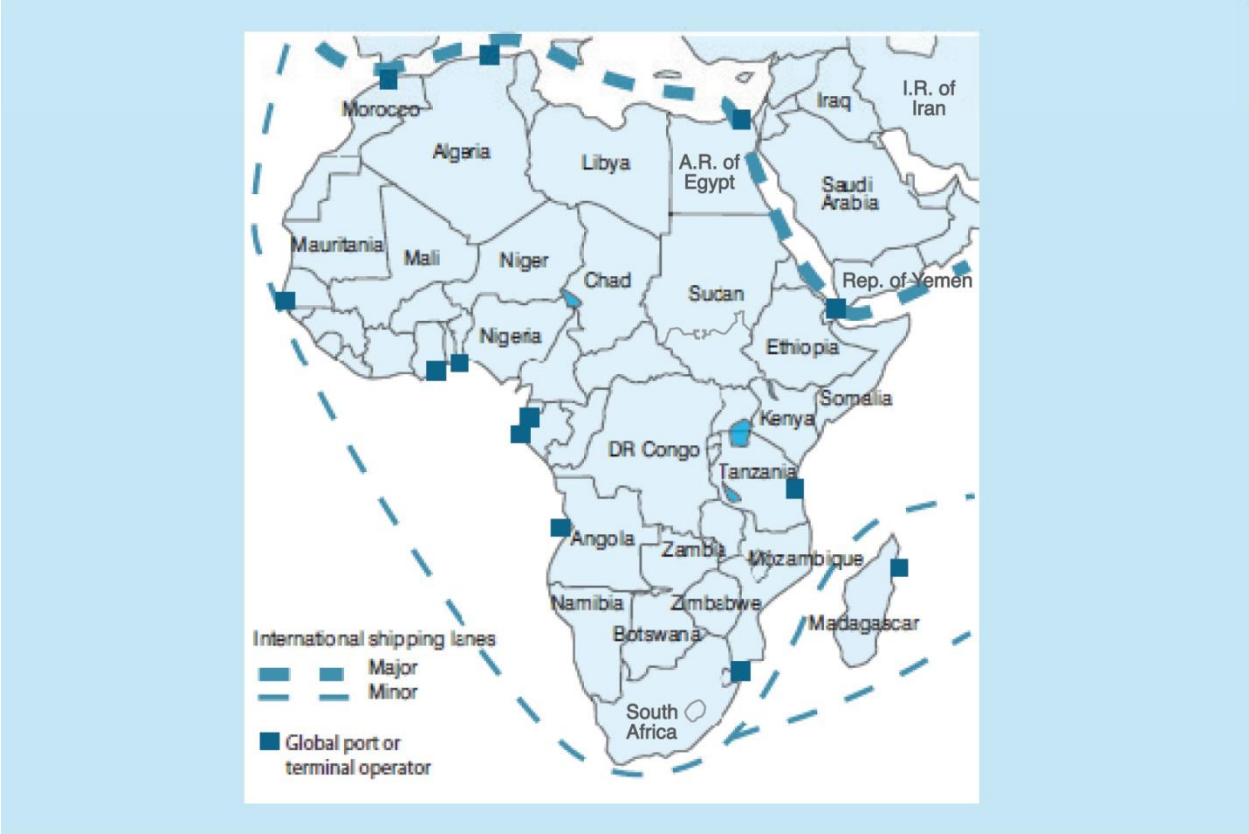
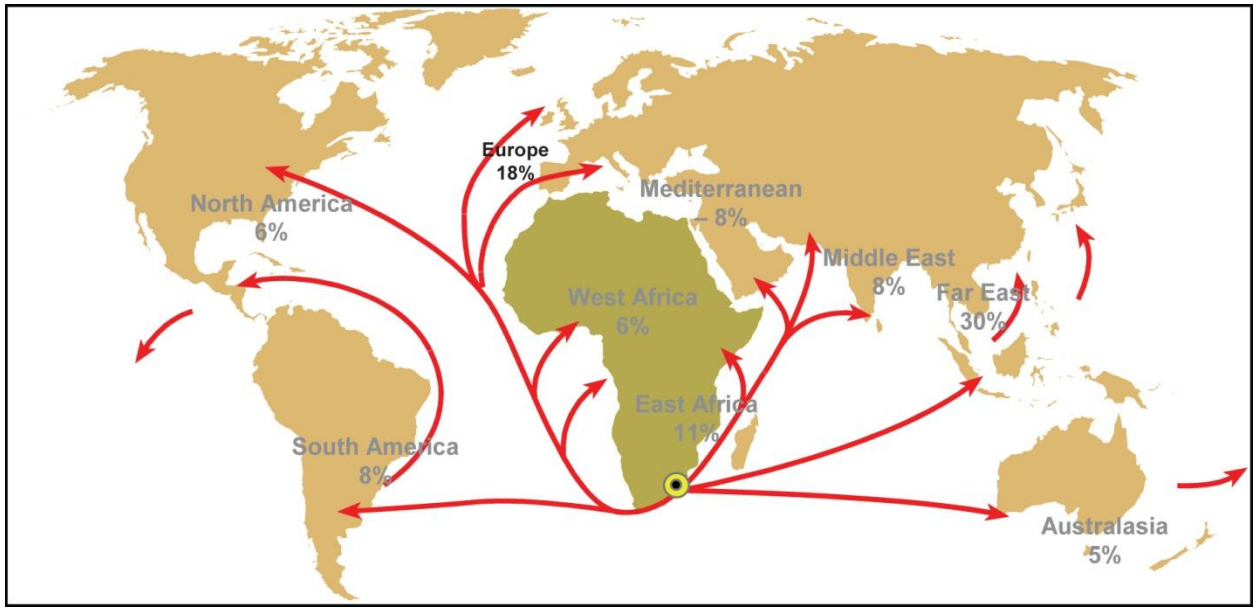
Annex 1: Trading Routes



Main International Shipping lanes through Africa[31]



[31] UNCTAD, 2009

Export Trading Routes: South Africa[32]

Annex 2: Total Port Traffic – Eastern and Southern Africa (Metric Tons 000)

Country	2005	2006	2007	2008	2009
South Africa	173 555	179 984	183 353	185 079	182 735
Kenya	12 978	14 101	15 536	15 996	18 957
Mozambique	6 321	6505	6571	7426	7 994
Namibia	3 131	3 603	4 236	4 690	No data
Tanzania	5 572	6 020	6 690	6 732	7 353

Annex 3: **Aerial View of the Port of Durban** [33]

[32] TPT

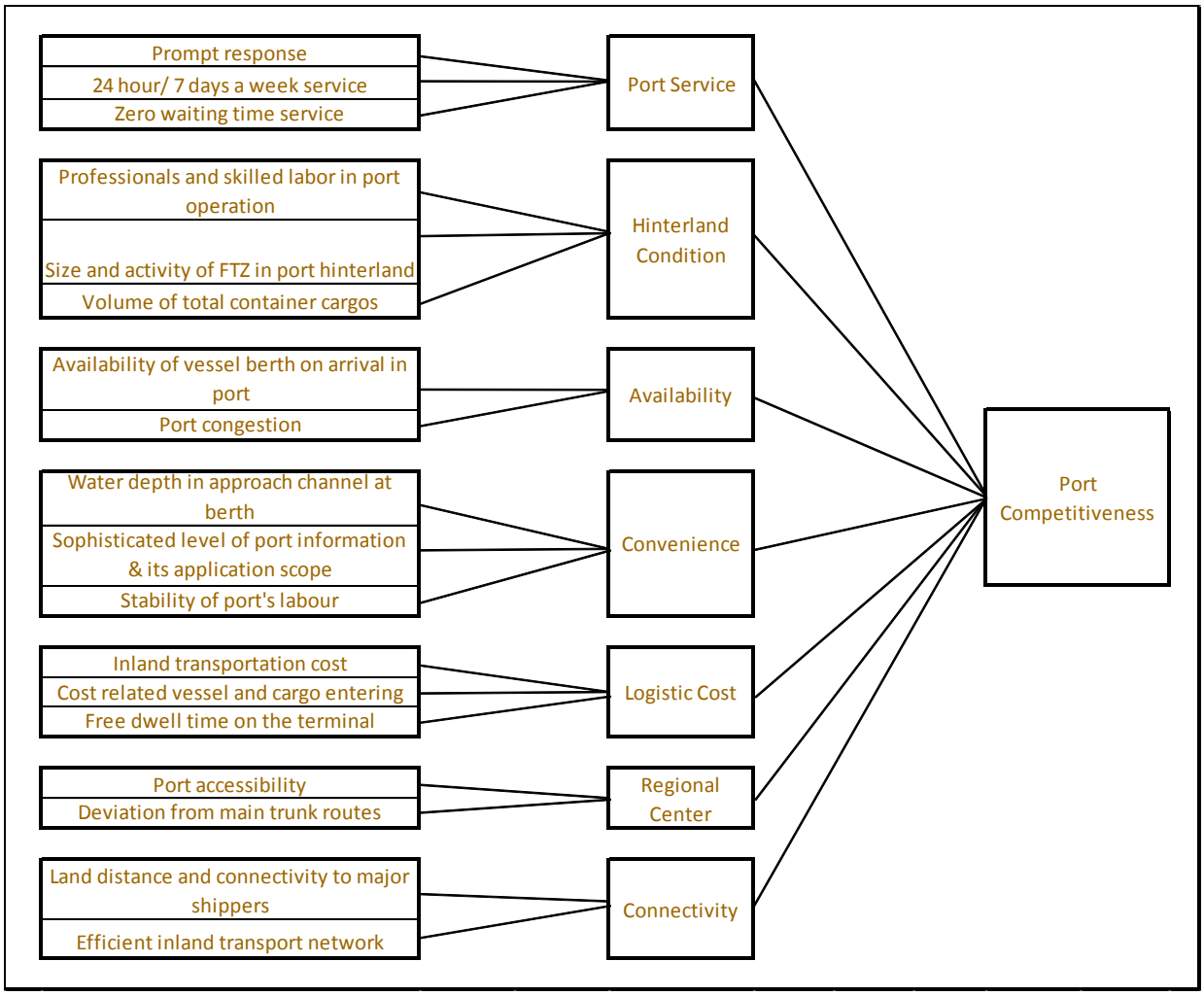
[33] Source : Transnet Port Terminals

Annex 4: Container Terminal Facilities

Berth Data

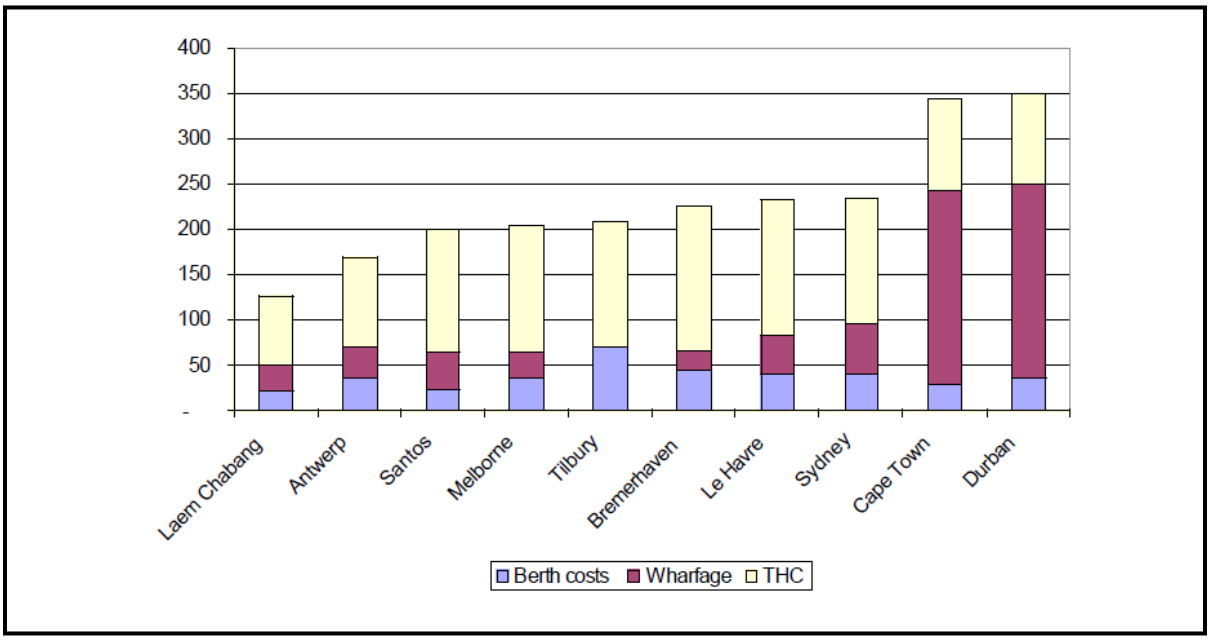
Entrance draft	Area	Berth (m)	Draft (m)	Length (m)
16.4	DCT	100	8.2	276
		101	11.6	229
		102	11.7	213
		103	11.9	235
		104	11.6	351
		105	11.9	235
		106	11.5	213
		107	11.7	238
	Cross berth	108	11.6	273
		109	11.8	272
	New Pier 1	201	11.9	216
		202	12.3	216
		203	11.8	305
		204	11.5	305
		205	11.7	305

Annex 5: Structure for evaluating container port competitiveness in Korea and China



Source: Gi-Tae Yeo *et al, 2008*

Annex 6: Total port and handling costs per TEU (USD)



Source: NEDLAC, 2007